CLAIMS

What is claimed is:

1. A nozzle having a spout through which a fuel flows from an upstream to a downstream direction, comprising a diaphragm disposed near a downstream end of the spout, the diaphragm responsive to fluid pressure in the spout such that a portion of the diaphragm flexes between a downstream position that opens the valve and an upstream position that closes the valve. (define flexing to include portions defined by opening)

2. The nozzle of claim 1 wherein the diaphragm has a opening through which the fuel flows.

3. The nozzle of claim 2 wherein the opening has at least three branches.

4. The nozzle of claim 2 wherein the opening has at least four branches.

5. The nozzle of claim 1 wherein diaphragm is substantially donut shaped.

6. The nozzle of claim 1 wherein the diaphragm comprises a continuous piece of a polymer.

7. The nozzle of claim 6 wherein the polymer is selected from the group consisting of a urethane, a rubber, and a silicone.

8. The nozzle of claim 1 wherein the diaphragm is positioned such that there is substantially no dead space between the diaphragm and the end of the spout.

9. The nozzle of claim 1 wherein the diaphragm has a flexibility such that during operation of the nozzle, a point of greatest travel of the diaphragm moves less than 2 cm.

10. The nozzle of claim 1 wherein the diaphragm is has a flexibility such that during operation of the nozzle, a point of greatest travel of the diaphragm moves at least one 0.25 cm.

11. The nozzle of claim 1 wherein flexing of the diaphragm is a passive function of changes in pressure of the fuel in the spout.

12. The nozzle of claim 1 wherein the diaphragm is packaged in an installation frame.

13. The nozzle of claim 1 wherein the diaphragm extends substantially normally across the spout.

14. The nozzle of claim 1 wherein the diaphragm has a multi-branched opening through which the fuel flows, and wherein the diaphragm has a flexibility such that during operation of the nozzle, a point of greatest travel of the diaphragm moves at least one 0.25 cm.

15. The nozzle of claim 14 wherein the diaphragm is packaged in an installation frame.

16. A diaphragm for use as a valve in a spout of an automotive fuel dispensing nozzle, comprising:
an outer portion sized and dimensioned to fit snugly against the spout;
an inner portion biased into a domed configuration, and having a fluid passageway that is closed in the domed configuration and open in a configuration other than the domed configuration; and
the diaphragm sufficiently flexible to at least partially open the fluid passageway when the diaphragm is subjected to a pressure less than 1.5 atmospheres.

17. The diaphragm of claim 16 wherein the domed portion is continuous with the outer ring portion.

18. The diaphragm of claim 16 wherein the fluid passageway comprises a opening.

19. The diaphragm of claim 16 wherein the opening has multiple branches.

20. The diaphragm of claim 16 wherein diaphragm is substantially donut shaped.

21. The diaphragm of claim 16 wherein the inner portion comprises a polymer selected from the group consisting of a urethane, a rubber, and a silicone.

22. The diaphragm of claim 16 wherein the diaphragm is sufficiently flexible to open the fluid passageway at least 90% when the diaphragm is subjected to a pressure less than 1.5 atmospheres.

AMENDED CLAIMS

[Received by the International Bureau on 28 April 2004 (28.04.04): original claims 1-22 replaced by amended claims 1-22 (2 pages)]

What is claimed is:

1. A nozzle having a spout through which a fuel flows from an upstream to a downstream direction, comprising:
   a diaphragm circumferentially coupled to and at a position near a downstream end of the spout, wherein the diaphragm has a body and a multibranched opening to form a pressure-activated valve; and
   wherein the diaphragm is responsive to fuel pressure in the spout upstream of the diaphragm such that a portion of the diaphragm flexes between a downstream position that opens the valve and an upstream position that closes the valve.

2. The nozzle of claim 1 wherein the fuel flows through the multi-branched opening.

3. The nozzle of claim 2 wherein the multi-branched opening has at least three branches.

4. The nozzle of claim 2 wherein the multi-branched opening has at least four branches.

5. The nozzle of claim 1 wherein diaphragm is substantially donut shaped.

6. The nozzle of claim 1 wherein the diaphragm comprises a continuous piece of a polymer.

7. The nozzle of claim 6 wherein the polymer is selected from the group consisting of a urethane, a rubber, and a silicone.

8. The nozzle of claim 1 wherein the diaphragm is positioned such that there is substantially no dead space between the diaphragm and the end of the spout.

9. The nozzle of claim 1 wherein the diaphragm has a flexibility such that during operation of the nozzle, a point of greatest travel of the diaphragm moves less than 2 cm.

10. The nozzle of claim 1 wherein the diaphragm is has a flexibility such that during operation of the nozzle, a point of greatest travel of the diaphragm moves at least one 0.25 cm.

11. Canceled.

12. The nozzle of claim 1 wherein the diaphragm is packaged in an installation frame.

13. The nozzle of claim 1 wherein the diaphragm extends substantially normally across the spout.

14. Canceled.

15. The nozzle of claim 10 wherein the diaphragm is packaged in an installation frame.

16. A diaphragm for use as a valve in a spout of an automotive fuel dispensing nozzle, comprising:

an outer portion sized and dimensioned to fit snugly circumferentially against the spout;

a flexible inner portion having a multibranched fluid passageway and biased into a domed configuration, wherein the fluid passageway is closed in the domed configuration and open in a configuration other than the domed configuration; and

the diaphragm sufficiently flexible to at least partially open the fluid passageway when the diaphragm is subjected to an upstream fuel pressure in the spout of less than 1.5 atmospheres.

17. The diaphragm of claim 16 wherein the domed portion is continuous with the outer ring portion.

18. The diaphragm of claim 16 wherein the fluid passageway comprises an opening.

19. The diaphragm of claim 16 wherein the multibranched fluid passageway comprises at least three branches.

20. The diaphragm of claim 16 wherein diaphragm is substantially donut shaped.

21. The diaphragm of claim 16 wherein the inner portion comprises a polymer selected from the group consisting of a urethane, a rubber, and a silicone.

22. The diaphragm of claim 16 wherein the diaphragm is sufficiently flexible to open the fluid passageway at least 90% when the diaphragm is subjected to a pressure less than 1.5 atmospheres.